

U.S. Patent Application Serial No. **10/757,453**
Amendment filed June 12, 2006
Reply to OA dated March 13, 2006

REMARKS

No amendment is made in this Response. It is believed that this Response is fully responsive to the Office Action dated **March 13, 2006**.

Claims 1-8 are rejected under 35 U.S.C. §103(a) as being unpatentable over Nishino et al. (U.S. Patent No. 6,089,278) in view of Nishi et al. (U.S. Publication No. 2002/0104575 A1).
(Office action paragraph no. 4).

The rejection of claims 1-8 over Nishino et al. and Nishi et al. is respectfully traversed, and reconsideration of the rejection is requested.

Summary of the present invention

The automotive fuel hose according to the present invention comprises: a tubular inner layer; a low fuel permeability layer provided on an outer peripheral surface of the inner layer; and an adhesive layer for bonding the inner layer and the low fuel permeability layer, wherein the inner layer comprises **a fluororesin having a functional group**; the adhesive layer comprises **a blend of polyamide resin and polyester resin**; and the low fuel permeability layer comprises **a polyester resin having a naphthalene ring**.

Effects of the invention:

(1) Since the **functional groups of the fluororesin** for forming the inner layer improve

adhesion with the polyamide resin for forming the adhesive layer, interlaminar adhesion can be improved between the inner layer and the adhesive layer. Further, since both the adhesive layer and the low fuel permeability layer are formed of polyester materials, adhesion between the adhesive layer and the low fuel permeability layer is also improved. As a result, the hose as a whole is provided with an improved interlaminar adhesion, thereby improving impact resistance.

(2) As "the polyester resin having a naphthalene ring" for forming the low fuel permeability layer, **polybutylene naphthalate (PBN), polyethylene naphthalate (PEN)** and the like are preferably used. On the other hand, **polybutylene terephthalate (PBT) has high fuel permeability and poor hydrolytic resistance due to hydrolysis with alcohol contained in the fuel** (see specification page 4, last line, to page 5, line 4, and Comparative Example 3 in Table 3). Therefore, in the present invention, "the polyester resin having a naphthalene ring" such as **polybutylene naphthalate (PBN) or polyethylene naphthalate (PEN)** is used for forming the low fuel permeability layer **in place of polybutylene terephthalate (PBT) having high fuel permeability and poor hydrolytic resistance.**

Regarding the cited references:

(1) Nishi et al. (US2002/0104575 A1)

Nishi discloses a fuel hose having a two layer structure comprising an inner layer made of a fluororesin; and **an outer layer adjacent [to the inner layer]** and made of a thermoplastic resin

other than a fluororesin (see Claim 1, emphasis added).

That is, the fuel hose of Nishi has the two layer structure in which the outer layer is directly laminated on an outer peripheral surface of the inner layer, and Nishi does not disclose or suggest a hose having a three layer structure in which an adhesive layer is interposed between an inner layer and an outer layer.

Nishi recites examples of materials for the outer layer of the fuel hose in paragraphs [0014 - 0017] as follows:

"a polyolefin such as polyethylene or polypropylene; a polyamide such as polyamide 6, polyamide 66, polyamide 610, polyamide 612, polyamide 11, or polyamide 12; a polyester such as polyethylene terephthalate, ... or a polystyrene type thermoplastic elastomer,"

and teaches that: **"Particularly preferred is a polyamide excellent in flexibility and low temperature impact resistance. Especially, polyamide 6, polyamide 11 or polyamide 12 is preferred"** (emphasis added). Further, the outer layers of Examples 1 to 5 of Nishi are all formed of **polyamide 12**, and Nishi does not provide any specific example of thermoplastic resin other than polyamide.

Although Nishi recites **polyethylene terephthalate (PET) and polybutylene terephthalate (PBT)** as the polyester for forming the outer layer materials, the reference does not disclose or suggest a "polyester resin having a naphthalene ring," such as **polybutylene naphthalate (PBN) and polyethylene naphthalate (PEN)**, which are used for forming the low permeability layer of the present invention. As described above, **polyethylene terephthalate (PET) and the polybutylene**

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terephthalate (PBT) are inferior to the polybutylene naphthalate (PBN) and the polyethylene naphthalate (PEN) in fuel permeability and hydrolytic resistance.

Accordingly, Nishi merely teaches the use of **polyamide** for outer layer in order to obtain improved flexibility and low temperature impact resistance, that is, Nishi does not disclose the use of a material having an excellent low fuel permeability for forming an outer layer in order to improve low fuel permeability of the fuel hose as a whole as disclosed in the present invention. Therefore, Nishi and the present invention have completely different objects.

(2) Nishino et al. (USP 6,089,278)

The tube for fuel transportation of Nishino comprises: an innermost layer comprising a material selected from the group consisting of fluorine type resins and polyamide type resins; a middle layer comprising a polyalkylene naphthalate resin; an outer layer comprising a thermoplastic resin or a thermoplastic elastomer; and an adhesive layer interposed between the innermost layer and the middle layer (see abstract).

Where the innermost layer of the tube for fuel transportation comprises a **fluorine type resin**, the adhesive layer between the innermost layer and the middle layer comprises: "an adhesive resin including: (A) **at least one selected from the group consisting of fluorine type resins, flexible fluorine type resins and fluorine type rubbers**; and (B) at least one selected from the group consisting of crystalline polyester type resins and polyester type elastomers" (column 3, lines 37-42,

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emphasis added; see Column 3, lines 27 to 43; Column 9, lines 27 to 37; and Examples 8 to 11 in Table 2).

Where the innermost layer of the tube for fuel transportation comprises a **polyamide type resin**, the adhesive layer between the innermost layer and the middle layer comprises "an adhesive resin including a **polyamide type resin** and a crystalline polyester or a thermoplastic polyester elastomer" (column 3, lines 14-15, emphasis added; see Column 3, lines 11 to 18; Column 9, line 49 to Column 10, line 5; and Examples 1 to 7 in Table 1).

That is, Nishino recites that where the innermost layer comprises a fluorine type material (**fluorine type resin**), the adhesive layer also comprises a fluorine type material (**at least one selected from the group consisting of fluorine type resins, flexible fluorine type resins and fluorine type rubbers**), and that where the innermost layer comprises a polyamide type material (**polyamide type resin**), the adhesive layer also comprises a polyamide type material (**polyamide type resin**). Therefore, Nishino merely discloses that **the innermost layer and the adhesive layer of the tube for fuel transportation are formed of the same type of materials**.

Since the fluorine type resin for forming the innermost layer of Nishino's tube does not have a functional group, if the adhesive layer is formed of a material of different type from the innermost layer, sufficient interlaminar adhesion between the innermost layer and the adhesive layer cannot be obtained.

Thus, Nishino does not disclose or suggest that an adhesive layer is formed of "an adhesive

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resin including a **polyamide type resin** and a crystalline polyester or a thermoplastic polyester elastomer" where the innermost layer of the tube for fuel transportation comprises a **fluorine type resin**, and the interlaminar adhesion between the innermost layer and the adhesive layer is poor due to the lack of a functional group in the **fluorine type resin** for forming the innermost layer.

Response to Examiner's Arguments in the Office action

(1) The Examiner first responds to "Applicants' argument that Nishi teaches away from the claimed invention ...," referring to Applicants' argument as stated on page 10, lines 2-8, of the last Amendment. However, Applicants respectfully submit that the Examiner has **misstated** Applicants' argument. Applicants did **not** state that "Nishi teaches away **from the claimed invention**." The stated argument was that Nishi "teaches away from a **combination** of the teachings of the Nishi et al. patent with the teachings of the Nishino et al. patent" (emphasis added). That is, Applicants' argument was that there is no suggestion or motivation for the combination of the references.

The Examiner refers to MPEP 2145(X)(D)(1), with heading D being: "References teach away from the invention ..." However, Applicants again note that this misrepresents Applicants' argument regarding the lack of suggestion to combine the references.

On page 3, lines 12-19, the Examiner discusses the teaching of Nishi. The Examiner's argument in this regard is summarized in the statement that:

"the functional group in Nishi is added to fluororesin to improve its adhesion to other non-fluorinated resins, which would include a layer formed of a blend of a polyamide

and polyester as taught in the claimed invention and Nishino.”

That is, as stated by the Examiner, the proposed modification is a substitution is of Nishino’s “layer formed of a blend of polyamide and polyester,” that is, Nishino's **adhesive** layer, for the outer layer in Nishi. However, the Examiner's proposed modification would clearly **not result in a functional hose in Nishi**, since there would be an adhesive layer in the place of a proper outer layer. A proposed modification **cannot render the prior art unsatisfactory for its intended purpose**. (See MPEP 2143.01(V), and *In re Gordon*, 733 F.2d 900, 221 USPQ 1125 (Fed. Cir. 1984)).

(2) As discussed above, Nishino does not disclose or suggest the use of **a blend of polyamide resin and polyester resin** for forming an adhesive layer where the innermost layer is formed of a fluorine type resin. Even if the adhesive layer of Nishino is formed of **a blend of polyamide resin and polyester resin**, since a fluorine type resin forming the innermost layer does not have a functional group, interlaminar adhesion between the innermost layer and the adhesive layer is poor. Although the Examiner states that Nishino teaches adding of a **polyamide type elastomer** to the adhesive layer, Nishino does not recite specific examples of the **polyamide type elastomer**. The adhesive layer in the automotive fuel hose according to the present invention comprises **a polyamide resin** such as polyamide 6, polyamide 12, or the like, but it does not comprise the **polyamide type elastomer** as the Examiner states. In the tube for fuel transportation of Nishino, where the innermost layer comprises **a fluorine type resin**, since the fluorine type resin

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for forming the innermost layer **does not have a functional group**, even if the adhesive layer is formed of "an adhesive resin including at least one selected from the group consisting of fluorine type resins, flexible fluorine type resins and fluorine type rubbers; at least one selected from the group consisting of crystalline polyester type resins and polyester type elastomers; and further, a **polyamide type elastomer**," the interlaminar adhesion between the innermost layer and the adhesive layer cannot be improved. In contrast, according to the present invention, since the functional group of the fluoro resin for forming the innermost layer of fuel hose improves adhesion with the polyamide resin for forming the adhesive layer, interlaminar adhesion between the inner layer and the adhesive layer can be improved.

With regard to the Examiner's view that "since the adhesive layer is defined in Applicants' claims as open to other resins in addition to the two claimed, the adhesive layer of Nishino reads on the adhesive layer of Applicants' claimed invention," although the adhesive layer of the present invention may further comprises a blend material including a compatibilizer **in addition to polyamide resin and polyester resin**, the examples of the compatibilizer include, ethylene-glycidyl methacrylate (EGMA), modified EGMA, and the like, but a fluoro resin is not included. Therefore, Applicant respectfully submits that the Examiner's view that "the adhesive layer of Nishino reads of the adhesive layer of Applicants' claimed" is incorrect.

(3) Nishi discloses a fuel hose having a two layer structure comprising an inner layer and an outer layer directly laminated on the inner layer, but does not disclose or suggest a hose having a

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three layer structure in which an adhesive layer is interposed between an inner layer and an outer layer. Further, Nishi does not disclose or suggest the use of "a polyester resin having a naphthalene ring" such as **a polybutylene naphthalate (PBN) and a polyethylene naphthalate (PEN)** as an outer layer material of a fuel hose.

The fuel hose of Nishi and the tube for fuel transportation of Nishino are completely different in the structures of the hoses as a whole (existence of an adhesive layer). The outer layer material of Nishi and the middle layer material of Nishino are completely different. Further, the object of Nishi is the improvement in flexibility and low temperature impact resistance, while the object of Nishino is the improvement in hydrolysis resistance and resistance against fuels. Accordingly, since the structures and objects of Nishi and Nishino are completely different, one having ordinary skill in the art would not be motivated to combine these prior arts and could not anticipate such a combination.

Applicants therefore submit that claims 1-8 recite a characteristic structure neither disclosed nor suggested by the cited references, and that the claims are not obvious over the cited references, taken separately or in combination.

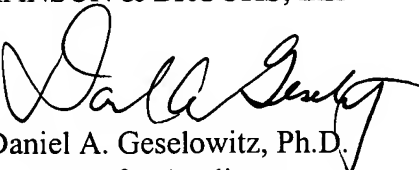
If, for any reason, it is felt that this application is not now in condition for allowance, the Examiner is requested to contact the Applicants' undersigned agent at the telephone number indicated below to arrange for an interview to expedite the disposition of this case.

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In the event that this paper is not timely filed, the Applicants respectfully petition for an appropriate extension of time. Please charge any fees for such an extension of time and any other fees which may be due with respect to this paper, to Deposit Account No. 01-2340.

Respectfully submitted,

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